FINAL REPORT

DEVELOPMENT OF A SASKATCHEWAN LAND RESOURCE CENTRE

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Prepared by: University of Saskatchewan

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Final Report

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Saskatchewan Land

University of Saskatchewan
Saskatoon
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Executive Summary

The provision of funds for a Saskatchewan Land Resource Centre through the Canada-Saskatchewan Agri-food Innovation Fund has resulted in the completion of a soil inventory database second to none for any province or territory in Canada. This soil database is a valuable asset as Saskatchewan moves forward in planning and evaluating activities and programs which will impact our agricultural sector, industrial and commercial development, and compliance under international agreements governing the environment.

The objectives of the project to develop further a Saskatchewan Land Resource Centre (SLRC) have been largely been realized. Soil maps and reports in the northern agricultural area have been completed. A large number of projects utilizing the Saskatchewan soil database have been initiated and completed in the term of the project funding. These projects have provided information to many clients for a variety of agricultural, environmental and industrial purposes.

The SLRC has promoted spatial soil information (maps and related databases) as a necessary component of land management and conservation decisions. The SLRC has lead and coordinated research in developing guidelines for effective use of soil information. The SLRC continues to conduct studies and research into the detailed use of data for such purposes as precision farming, the creation of linkages to other land - related databases and to participate in and conduct workshops, GIS training courses, and field tours. Staff at the SLRC continually strive to develop partnerships which work toward developing the best possible digital soils database and map coverage for the province and prairie region.

The infrastructure is being established to ensure long term access to soil information. Dr. Lorne Crosson, a consultant familiar with Soil Survey, has provided a report and advice for a business plan with the objective of making the Centre self-sustaining in the long term. A Centre review has been conducted and largely implemented. The Centre has updated its information technology capabilities by implementing a new GIS system ensuring compatibility with the majority of the industry requiring GIS related data.

The Land Resouce Centre, through the sale of reports and services, special projects and major research projects, has been able to match dollar for dollar, the $570,000 provided under AFIF effectively doubling the impact of the funds provided.

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Introduction

The Saskatchewan Land Resource Centre, in a sense, is a term used to identify a particular focus on the application of spatially based soil data to current land use problems in the Province. The Saskatchewan Land Resource Centre is part of the Saskatchewan Centre for Soil Research (SCSR), the officially recognized "Centre" at the University of Saskatchewan, which has developed from what was known as the Saskatchewan Institute of Pedology (SIP). The SIP, which was originally formed in 1965, brought together in a formal cooperation agreement the Province, Agriculture and Agri-food Canada, and the University to be responsible for soil survey and related research activity. This association continues today in the SCSR, and includes not only continuing input from the Land Resource Unit of SPARC, but greater involvement from University research staff, particularly Professors D. Anderson and D. Pennock.

In 1920, a Royal Commission on Better Farming recommended that a soil survey be carried out to "*outline the various soil areas and classify them as to their suitability for grain growing and livestock raising and that the reconnaissance survey be followed by a more complete agricultural survey in order to render the investigational work of the College of Agriculture and Experimental Farms more effective.*" By 1947 the first reconnaissance soil inventory of the agricultural region was completed.

The Province has traditionally provided funds to the University for the soil survey which began with a joint Federal, Provincial and University initiative in the early 1920s. In 1965 this was formalized in the agreement that set up the Saskatchewan Institute of Pedology, with the provincial funds to be 50% of the federal support for their staff and programs based at the University. The SIP was, and the Saskatchewan Centre for Soil Research (SCSR) that succeeded it is, a cooperative program that works very well, and has been modeled by several other provinces. Support for soil survey was strong through the 1980s and into the early 1990s, permitting the completion, as agreed to as a condition of funding, of the re-survey of the agricultural part of the Province at a scale of 1:100,000 for 67 million acres of agricultural land (45 % of the agricultural land in Canada) and about 23 million acres of productive forest in the Province. Recently, through a cooperative project with Sask Geomatics, the entire soil inventory has been geo-referenced and is now available in digital format suitable for GIS applications.

Saskatchewan has been well-served by having comprehensive and reasonable soil surveys with the publication of Soil Reports #12 in 1944 and 13 in 1947, and the subsequent publication of semi-detailed maps and reports since that time. To some degree, because the information has generally been available and of reasonable quality, the information has been taken for granted. It has been used very effectively in the municipal assessment system, in planning major developments such as the South Saskatchewan Irrigation Project, and in the Soil Capability for Agriculture program. Soils data continues to be used in the planning and implementation of national and provincial programs, and in local and regional projects, particularly in the areas of crop suitability for new or innovative crops, manure management, precision farming, pesticide applications, soil carbon sequestration, and soil quality. The Ecological Land Classification system (Eco-regions of Saskatchewan) developed jointly by SCSR and other resource scientists, is widely used both administratively and operationally by Saskatchewan Environment and Resource Management, and related agencies such as the Conservation Data Centre.

The current "state-of-the-art" facilities in the Agriculture Sciences Building provide quality office space, field facilities, as well as an soil analytical laboratory. GIS and data base management technology and technical support are available at low cost through a U of S based Arc/Info consortium agreement. Efficiencies of shared facilities and a combined workforce of AAFC and U of S employees provide the essential critical mass of skilled technical personnel which is of particular importance in the highly technical areas of data base management and GIS.

Effect of Ending Provincial Support for the Saskatchewan Land Resource Centre

The immediate effects of the termination of provincial financial support for the SLRC would be:

1) In the short-term, the loss of services provided by the three staff supported by AFIF funds. These staff have a large amount of experience among them including 20 years of combined soil mapping, classification, and field research; 45 years of combined data analysis, GIS operations and soil interpretations. These staff carry out a large number of roles within the SLRC including the completion of the projects outlined in this report. In addition, there is a significant consulting role played by the staff through handling

phone queries, email and mail data requests, and walk in requests for information. These activities lead to the distribution of over 1000 maps, reports and consultations yearly to an array of industry, government representatives, consultants, producers, schools and the like.

2) The SLRC provides the institutional framework for linkage between academic faculty at the University (principally Dr. Dan Pennock, Dr. Darwin Anderson and others) and the Federal and Provincial land resource staff. The loss of the SLRC will inevitably lead to reduced participation by the Department's academic staff in land evaluation activities in Saskatchewan. Given that most land analysis applications require cooperation among disciplines, location of the provincial staff at the U of S provides the opportunity for integration and linkages with staff at the University level (Ag Engineering, Geography), the College level (CSALE, Plant Sciences, Ag Economics) and in particular with the Saskatchewan Centre for Soil Research which has a strong Pedology and Landscape analysis program. In addition, the location of the provincial soil database and the associated researchers at the University, supports teaching and research in land evaluation and GIS, as well as other research groups such as CSALE. The experience in Alberta has been that the loss of the link between provincial, federal, and university staff quickly leads to a loss of access by potential users to the existing soil resource inventories.

3) In short, a loss of critical mass of personnel for an effective program. The collective wealth of knowledge and expertise concerning the Province's soils which currently resides within the SCSR, and which is effectively leveraged through the provincially-funded staff there, will largely be lost. In the medium term (i.e., 2-4 years), this may lead to a loss of the Agriculture and Agri-Food Canada Land Resource Unit staff to their administrative headquarters in Swift Current, bringing to an end the effective utilization of soil inventory data in Saskatchewan. This loss would include the present level of support offered to SAF staff, and preclude any expansion of this role. The federal Land Resource Unit staff are now part of the Western Land Resources Group, a project-oriented team that includes all AAFC resource scientists from the four western provinces. Their location at the University, and cooperative projects with University scientists, provides a strong link and rationale for land evaluation projects of the entire western region.

The Challenge and Opportunities for the Future

The Province of Saskatchewan has made quite a substantial financial investment over the past 80 years to create the best soil resource inventory in the nation. Today's challenge for the Saskatchewan Land Resource Centre is to foster utilization of the soil database by a) ensuring that all branches of SAF and associated agencies such as Crop Insurance, are made aware of the potential of the soil resource inventory and b) provide the training required to ensure that optimum use will be made of the inventory.

Examples of the proposed future activities are:

- Targeted extension activities based on a combined land resource/socio-economic analysis of cropping and diversification potential. The goal of this activity is to identify the areas of land where the potential exists for a given agricultural activity (e.g., production of pulse crops or the establishment of pasture in rotations) but where the activity is not currently being practiced. These designated areas then become the optimum areas for the delivery of targeted extension activities.
- The SLRC is strengthening its relationship with the Centre for Studies in Agriculture, Law, and the Environment at the University to ensure high quality socio-economic analysis can be linked with the soil resource inventory.
- Optimum use of soil resource information in the management of provincially owned lands. The Land's Branch of SAF manages extensive areas of land in the province. Soil resource inventory, utilized within a GIS environment, provides an excellent tool for the inventory and the assessment of the potential of this land for optimum and sustainable use.
- Training of provincial staff in the use of GIS and soil resource data. The effective use of the soil resource data requires that the users be trained in the technology required to access and analyze the data. The SLRC provided a very successful two-day GIS training workshop to 45 users in 1999. The training component also highlights the need for continued integration of the provincial, federal, and University staff in the development of the educational aspect of the Centre's program.
- Continued responsibility for the maintenance, update, storage, distribution and interpretation of the Land Resource data base (maps, reports, digital files etc) compiled over a 50 year period.

Overview of the Land Resource Centre Program

A major component of the mandate of the Land Resource Centre has been the application of soil resource information to solve problems and to provide solutions related to soil and land management issues. These are often complex problems which require large amounts of data to be compiled relating to a variety of subjects before analysis and a solution may be provided. Soils information may be a small or a major component of such analyses. In any case, the goal of the Centre has been to provide the level of detail and analysis required to reach a equitable solution. As indicated by the initial architects of the Soil Inventory program in the early 1920's, soil information is not meant as an end in itself but rather a means to an end. As such the Centre has provided information and services to reach those ends, wherever and however possible. Whether through the distribution of soil reports and maps in the traditional paper form, or in the utilization of the Centre GIS capabilities and extensive interpretive capability of Centre staff to provide very customized solutions, the needs of the client are foremost.

Major Projects

To this end, over the three year period of the Funding agreement over 50 major projects have been initiated and completed, utilizing soil information and Centre capabilities in a variety of capacities.

Distribution of Maps and Reports

Over 3300 soil maps and reports have been distributed to students, farmers, schools, government agencies and private companies across Saskatchewan, Canada and North America. While students and schools receive these reports free of charge, map and report distribution contributed $ 25,000 to the operation of the Centre. Although this amount is not adequate for support of a self-funded Centre, it does allow for the maintenance of a Map and Report Resource Library and continued availability of information in paper form.

Demand for digital map products continues to increase as more agencies begin to take advantage of GIS capabilities. Approximately 150 soil maps have been distributed in digital form generating approximately $10,000 in revenue. These funds have allowed the Centre to upgrade hardware and software in the Land Resource GIS lab, maintaining the state of the art capabilities necessary for research and teaching purposes.

Major Research Programs

AFIF funding has provided a base level of funding upon which the Centre has been able to build and actively pursue and attain significant research projects. This includes the $210,000 project funded jointly by the Greenhouse Emissions Management Consortium (GEMCo) and by AAFC's matching initiative program, and the Weyerhaeuser soil mapping project

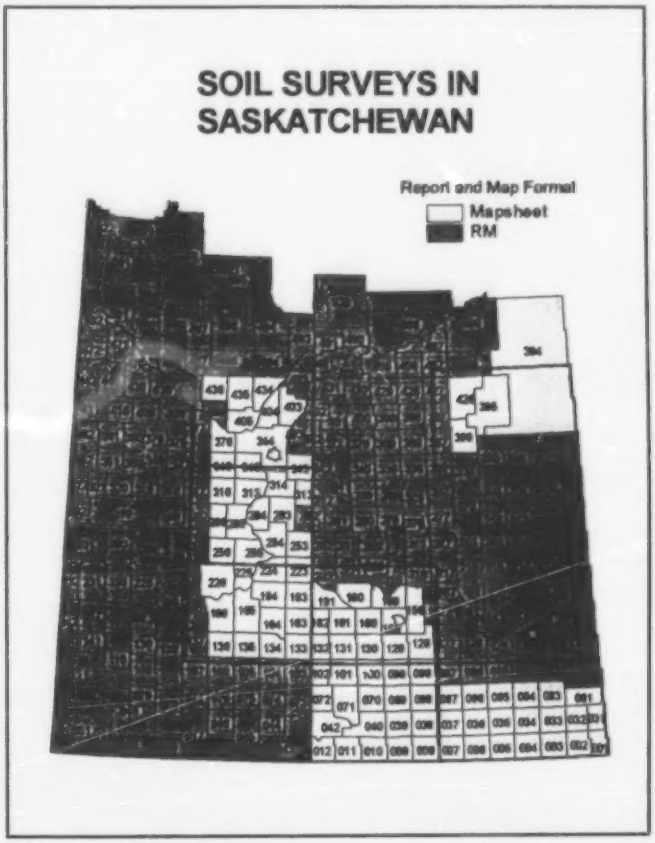
In summary, the Land Resouce Centre, through the sale of reports and services, special projects and major research projects, has been able to match dollar for dollar, the $570,000 provided under AFIF effectively doubling the impact of the funds provided.

Activities of the Land Resource Centre

Project Phase A. Compilation of Soil Maps and Reports.

As outlined in the original proposal, the completion of the map digitization and compilation for the agricultural component of the province of Saskatchewan was a necessary requirement in order to provide seamless (consistent and comprehensive) soil and landscape interpretations anywhere in the agricultural area of the province. Map digitization, map compilation and report preparations were completed for all RMs indicated in the original proposal. These include the following RMs (by number): 456, 463, 464, 466, 467, 486, 487, 488, 490, 491, 493, 494, 496, 497, 498, 499, 501, 502, 520, 521 and 555.

Completion of Project A fulfills all requirements of phase A of the AFIF contract.



Completed Soil Map Coverage for Agricultural Saskatchewan

Project Phase B. Land Resource Centre Staffing.

The follow people have been employed by the land Resource Centre with funds completely or partially supplied by AFIF funding.

M. Bock	Map compilation, database development, map digitization, GIS applications
D. Cerkowniak	GIS Applications and Development, Database Development, Special Projects, Field Projects
H.C. de Gooijer	Special Projects, Operations manager, GIS applications, Database Development, Field Projects
A. Frick	Carbon Sequestration Modelling
S. Johnson	Map compilation, database development, map digitization, GIS applications (Technical)
P.M. Krug	Map compilation, database development, map digitization, GIS applications
C. Lang	Map compilation, database development, map digitization, GIS applications (Technical)
D. Shaw	Soil Conflation - GIS
C.Stushnoff	Map compilation, database development, map digitization, GIS applications
R. Stushnoff	Map compilation, database development, map digitization, GIS applications

Project Phase C. Land Resource Centre Review

A component of the development of the Land Resource Centre was the review of current operations to properly focus current and future activities in areas of research, product development and extension, in order to provide the greatest benefit to the agricultural community of Saskatchewan.

In order to achieve this goal, Dr. Lorne Crosson, was hired under contract to determine the required information for the Centre. Dr. Crosson was chosen based on his qualifications of being very familiar with agricultural concerns at the farm level and his familiarity with extension and research issues through his involvement with the executive of organizations such as the Saskatchewan Soil Conservation Association and the Senate of the University. Dr. Crosson's background and understanding of soil survey also allowed him to effectively acquire the required information from interviews.

Dr. Crosson was supplied with a general mandate, as indicated below, but was free to conduct his interviews and data gathering in manners he determined as suitable. He was supplied with a list of all clients of the Land Resource Centre which have had interaction with the Centre in the past two to three years.

General Guidelines for Centre Review:
(Soil Survey Information and Land Resource Information are considered to be the same)
1) How have you used Soil Survey Information?
2) How would you identify the role of the Soil Survey?
3) Do you utilize management, consultive, and interpretive expertise and if so, how?
4) Do you utilize reports, maps and data which are available and if so, how?
5) Do the current functions of the Soil Survey meet your perception of what it should be doing?
6) What other functions/areas of expertise should/could the Soil Survey be operating in?
7) What forms of data, reports, maps, information are most important to you?
8) What other sources of land resource information are utilized as additional verification of information obtained from the Soil Survey?
9) Who should know of the data, maps and reports maintained by the Soil Survey?
10) Who currently does not know of the data, maps and reports maintained and made available by the Soil Survey?
11) What purposes are the data used for?

12) What trends may affect the use of information now and in the future?
13) What activities/actions are required in order to increase visibility of the Soil Survey?
14) What activities/actions are required to maintain a role and service within the agricultural industry of Saskatchewan?
15) What types of products/ interpretive/ consultative services should the Soil Survey offer now and into the future?
16) What types of products/services would you find most useful in the future?

Dr. Crosson, by questionnaire, personal interview or telephone interview, reported that many of our clients consider that awareness of the Soil Survey and its products is generally low, and people were unsure of the role of the Soil Survey. He recommended a more vigorous awareness program including advertising, information on the Internet, visible participation in agricultural shows and technology transfer events. Interestingly, Soil Survey personnel have been more aggressive in marketing their products and increase visibility for the past decade, but more effort is required.

Soil maps and reports are the most popular Soil Survey product, with computer-based RM reports (LANDBASE) used to a lesser degree. There is increasing interest in digital information as GIS technology becomes more available and standard. Many clients consider that the information may not be at the scale they require, and that the soils data is used in conjunction with other resource information as aerial photo- graphs and soil analysis. This indicates an important research and consultative role for the LRC staff in the future.

In summary, the report make the following recommendations:

1) Aggressively advertise Soil Survey products and services.
2) Provide access to Soil Survey products on the Internet and on CDs
3) Set up a 1-800 number staffed by Land Resource Centre personnel to provide a consultive and interpretive service for clients.
4) Continue emphasis on creating a seamless digitized soils database for the province with the eventual goal of creating a land resource map of the Great Plains in conjunction with neighboring provinces and states.
5) Address the concerns expressed by those who would prefer a digitized attribute database rather than a digitized soils map.

6) Work in conjunction with consultants, industry agrologists, SAF, PFRA, etc., and in particular with schools to produce information packages specifically designed to meet their individual requirements.
7) Respond to requests for site specific soils mapping.
8) Advocate field training as a requirement for undergraduate soils major.
9) Offer field training and workshops for those who do soils research and for those who use Soil Survey information and products.

Project Phase D. Land Resource Centre Operations.

Management of the Centre is a cooperative effort between Dr. Darwin Anderson (Principal Investigator) , Dr. Dan Pennock and Glenn Padbury (Section Head, Land Resource Unit, Semiarid Prairie Agricultural Research Centre (SPARC)). The management committee allocates resources between federal and university employees who collaborate and cooperate on all Centre activities. Activities of the Centre were focused on activities which were governed by the Principles as outlined in Appendix A sections, *Objectives and Implementation*. Some specific activities as outlined included:

A) Web site Development - the Land Resource Centre has developed the following web site: http://www.ag.usask.ca/departments/scsr/land/index.html to conform to the format of the College of Agriculture and Department of Soil Science.

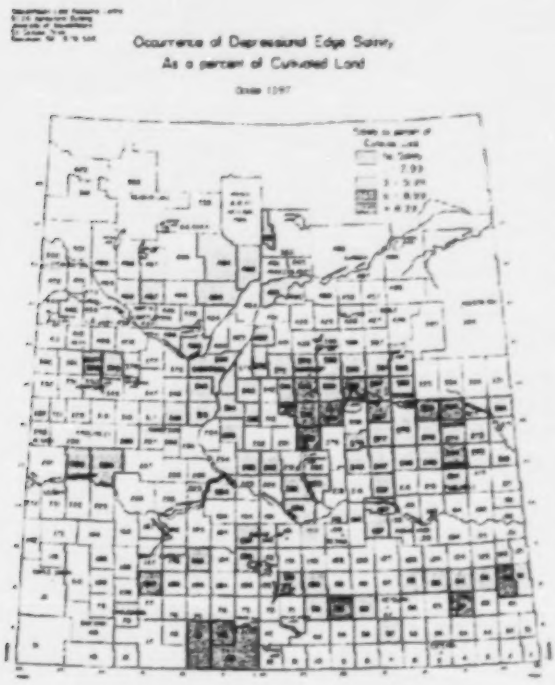
B) Negotiation of Memoranda of Understandings/Data Sharing Agreements - An agreement has been signed which reduces the barriers to data access between the Land Resource Centre and the Saskatchewan Property Management Corporation, SaskGeomatics Division. In summary, the agreement provides for SaskGeomatics to be a distributor of Saskatchewan digital soil maps, with a collection of royalty for such service. The Land Resource Centre receives access to required digital base map information for the various projects that is undertakes.

Applications of Soil Resource Data

The following descriptions outline projects undertaken by the Land Resource Centre in the past three years. Projects are indicated as being collaborative or confidential projects. While the basic soils information is part of the public domain, information generated through confidential projects will not be released to the general public unless done so by the cooperating agencies. Specific arrangements under collaborative projects will determine the distribution of project results.

1. Occurrence of Depressional Edge Salinity - Ducks Unlimited Canada

(Confidential Project).



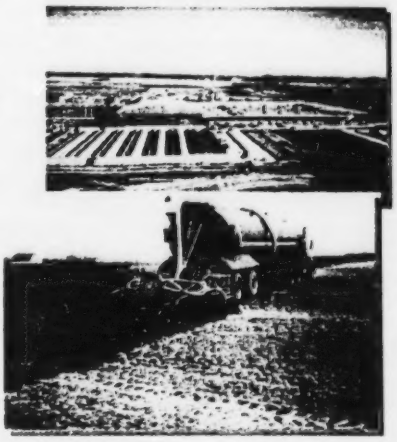
Funding - Ducks Unlimited Canada

In the process of planning environmental projects, Ducks Unlimited, requested the determination of the number of acres of cultivated land in the Province affected by what is commonly known as "bath tub ring" salinity, that is variably saline land on lower slopes adjacent to potholes. A map of the province was prepared indicating the percentage of the these saline soils which occur in each RM. An accompanying report contained data on cultivated and saline acreage in tabular format.

Occurrence of Depressional Edge Salinity. October 1997.

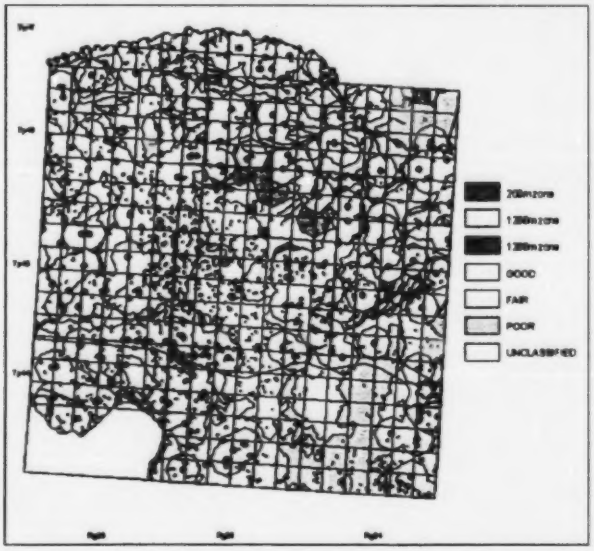
2. Heartland Livestock Hog Development Projects

(Confidential Project).
Funding - Heartland Livestock



The Land Resource Centre has developed a soil and landscape evaluation procedure in conjunction with Heartland Livestock Services and the Environment Manager of Saskatchewan Wheat Pool for initial or Phase I assessments of all potential sites for Heartland hog barns and feedlot sites in the Province. Sites for potential hog barns and feedlots are submitted by the Heartland production managers and community groups partnering with Heartland Livestock. The assessment process relies heavily on soil and landscape information on record in the Saskatchewan Soil Database and other databases on file with the Centre. Over 200 sites have been assessed for hog developments in 15 different projects across Saskatchewan. Evaluations of this kind are a critical but largely invisible part of developing the hog industry in an environmentally and socially responsible manner.

Suitability for Hog barn Site Location and Manure Applications



Top - Barn Site at Neilburg, Saskatchewan

Middle - Application of Hog manure.

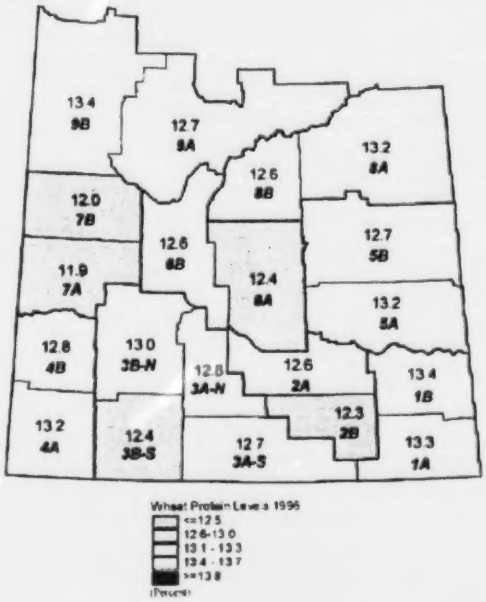
Bottom - Hog Site Suitability Map .

3. Fertilizer use on the Prairies - Canadian Fertilizer Institute

Funding supplied by the Canadian Fertilizer Institute.

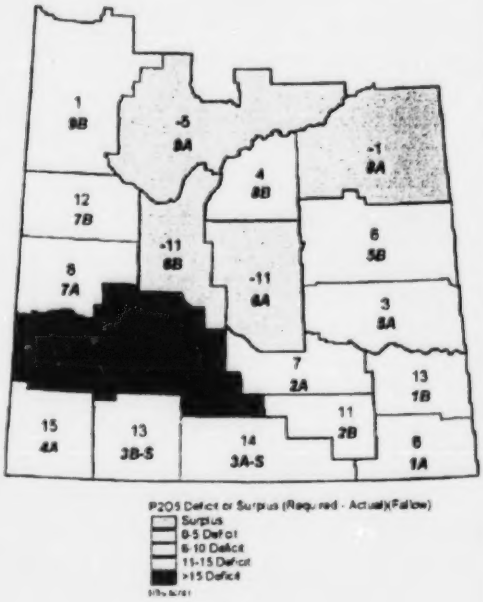
A series of maps of Saskatchewan depicting fertilizer requirements, actual fertilizer use, crop yields, potential yields, expenditures on fertilizers and potential expenditures, actual crop protein contents, and ten-year average crop proteins was produced on a crop district basis.
A series of over 30 maps were produced based on base map information supplied by the Land Resource Centre combined with fertility and fertilizer information supplied by the Canadian Fertilizer Institute. A subset of these maps were featured at the Wheat Protein Symposium held in Saskatoon, March 8-11, 1998.

Wheat Protein Levels 1996



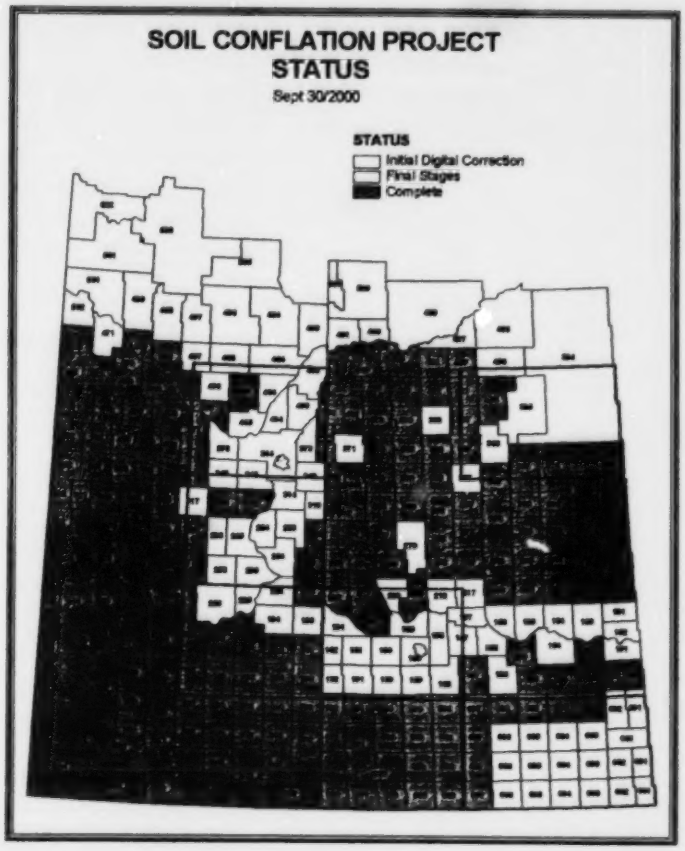
Wheat Protein Levels Saskatchewan 1996

P_2O_5 Deficit or Surplus (Required - Actual)(Fallow)



Nutrient Deficit and Surplus

4. Soil Conflation Project.



Sask Geomatics, a Division of Saskatchewan Property Management Corporation, has developed a SaskGIS base map standard for Saskatchewan. In an effort to standardize to a common base map, the Land Resource Centre, in partnership with PFRA, initiated a project to make digital soil maps compatible with SaskGIS standards. Approximately 90%of all Rural municipalities have currently been processed with priority being given to areas which require soils information as part of a research study. Funding to assist in this project has been obtained through the Canada - Saskatchewan Agriculture Green Plan.

5. Strawberry Hills Residential Site Evaluation Project

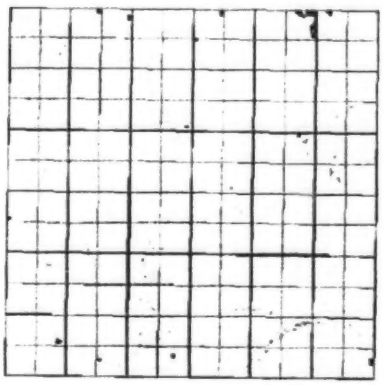
(Confidential Project).

A quarter section mapping project was conducted on behalf of developers who wished to make a submission for re-zoning agricultural land for residential developments. Soil maps were drawn in detail based on field inspections, and soils of greater and poorer agricultural potential were delineated.

6. Land Use in the Buffalo-Pound/Lake Diefenbaker area of the Qu'Appelle Valley

(Confidential Project).

In conjunction with Saskatchewan Water Corporation, soil, irrigation and land use maps were prepared for a section of the Qu'Appelle valley to assist planners in assessing future irrigation potential and engineering projects.



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Qu'Appelle Valley Study Project

Land Use

- Cultivated Crop Land
- Forage
- Grasslands
- Shrubs
- Trees
- Wetland
- Water
- Non-Agricultural
- Clouds and Shadow
- Mud Sand/Saline
- Unclassified Areas

Information Obtained from
Western Grain Transition Payments Program (WGTPP)

Produced by
Land Resource Centre
University of Saskatchewan Campus
SC26 Agriculture Building
51 Campus Drive
Saskatoon, Sask. S7N 5A8
Ph: 306-975-4260
Fax 306-966-4226

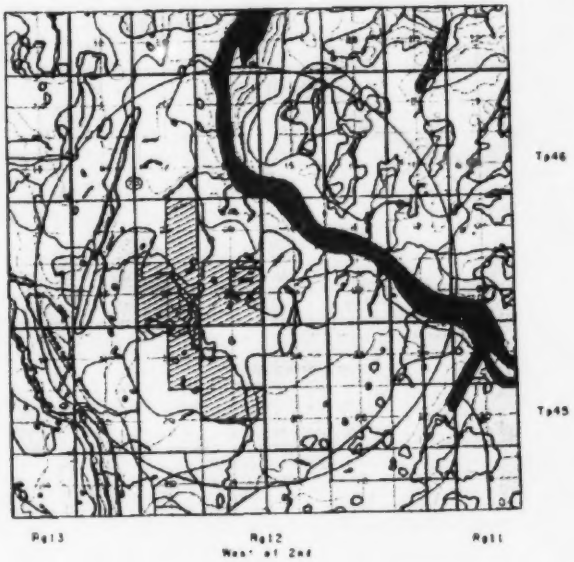
Funded by
Sask Water

For further information contact
the implementing agencies
Sask Water
June 1987

Map from Publication: M137 Irrigation Suitability and Land use for the Qu'Appelle Valley (Buffalo Pound/ Lake Diefenbaker Area)

7. Water Erosion Potential Map (Pasquia Pork Producers)

Funding - Quadra Management (Pasquia Pork Producers)



Concerns from local residents were expressed about potential contamination of surface water supplies to farms and the town of Arborfield by the Pasquia Pork Producer Pork Development in Northeast Saskatchewan. Land Resource Information in combination with SaskGeomatic elevation data was used to rate the water erosion susceptibility of different soils and landscapes in the project area. The purpose of the map was to aid in addressing public concerns regarding the possible contamination of local water sources through the application of manure to lands near the hog barns and near surface water supplies. Buffer zones were placed around significant hydrological features, and adverse soil and landscapes were identified indicating the areas that should be avoided with manure applications or requiring intensive management to reduce potential for surface water contamination by runoff. As a result, a number of proposed manure application areas were removed from the manure application area.

8. AgrEvo Research Farm Suitability Study

Funding - AgrEvo

Detailed mapping to evaluate soil and landscape characteristics on two quarter sections of land was performed on contract for AgrEvo. The purpose of the study was to determine the suitability of a selected site for a field research facility. A soil map and report, characterizing the soils and landscapes were forwarded to AgrEvo.

9. Salinity and Wetland Classification for the Dana Hills Landscape Area

Funding - Ducks Unlimited Canada

As a follow-up to the original project to determine the number of acres of cultivated land in the Province affected by what is commonly known as "bathtub ring" salinity, a regional study was launched in the Dana Hills area to determine the occurrence of salinity in association with wetlands. Initial maps were produced and reviewed, resulting in a revamping of project criteria and a re-evaluation of the project area. Field inspections were completed in late fall 1998 to ground truth selected map areas. The final report and series of maps were delivered to Ducks Unlimited Saskatoon and Melfort offices.

10. Cyanamid Field Site Evaluations

Funding - Cyanamid

Cyanamid Canada was investigating the correlation of specific soil characteristics in various areas of the province with residual characteristics of some of their herbicide products. Soil and landscape characterizations were provided for specific claim sites in Saskatchewan. In addition, research test plot sites were identified within Saskatchewan.

11. Influence of Hog Manure Application on Water quality and Soil Productivity

(Collaborative Project)
Funding - ADF, Saskatchewan Wheat Pool

Cooperators - Dr. Charles Maulé - Department of Agricultural & Bioresource Engineering, University of Saskatchewan
Dr. J. Elliott - Agricultural Hydrologist, National Hydrology Research Institute

In collaboration with project cooperators, the project is proposed to determine the effects of hog manure on dryland crops in 1) measuring the presence and

accumulation of nutrients and potential pollutants in soils, in runoff waters and in groundwater, 2) to provide recommendations that reduce the occurrence or accumulation of environmental or health related pollutants; 3) provide recommendations for application rates based on soil land forms and 4) to establish a protocol for long-term monitoring.
The Land Resource Centre has provided soil sampling, neutron probe installation and deep core sampling (3.5 metres) for sites at Perdue and Elstow.

This is a five-year study to be completed in 2003.

12. Estimating the Potential for Carbon Sequestration in Agricultural Soils at Field to Regional Scales

Funding - Greenhouse Gas Emissions Management Consortium (GEMCo)
Increasing the amount of organic matter stored in agricultural soils is thought to be a feasible strategy to offset carbon dioxide emissions to the atmosphere from the burning of fossil fuels; one step in the process to fulfill the terms of the recent Kyoto protocol. The Century organic matter simulation model was adapted and applied to Prairie agricultural conditions to provide a quantitative assessment of carbon sequestration, and used both to estimate carbon storage on a particular field (landscape) under a specific management, and to estimate the regional potentials for carbon sequestration. Required input variables from soil and related maps, and output from the models were linked through the Land Resource Centre GIS and Saskatchewan Soil Databases. This project has a total budget of $210,000 over three years funded by the consortium of western Canadian utility companies, that make up the Greenhouse Emissions Management Consortium (GEMCo) and AAFC. It involved Arlan Frick, a research associate in the Centre, D. Anderson and D. Pennock, with Darrel Cerkowniak co-ordinating GIS activities for the project. Complete details on the project may be found in the final report "*Simulation Modeling to Estimate Organic Carbon change in Agricultural Soils of the Canadian Prairies.*" Saskatchewan Centre for Soil Research Publication No. M144, March 2000.

13. On-Farm Adaptation/Diversification in East-Central Saskatchewan

Collaborative with PFRA, the Centre for Studies in Agriculture, Law and the Environment, (CSALE) and Agricultural Economics.)

The Land Resource Centre was engaged in research aimed at assisting producers in the East-Central region of the province respond to the loss of transportation subsidies by identifying alternative cropping systems. The economic feasibility of using new crops and crop rotations, and the potential environmental and socio-economic impacts resulting from different alternatives were investigated. The project was undertaken in cooperation with CSALE (Centre for Studies in Agriculture, Law and the Environment), and the Department of Agricultural Economics, University of Saskatchewan. The study area includes ADD board districts 18 and 19, encompassing 11 rural municipalities.

In consultation with PFRA, Saskatchewan Agriculture and Food, and other U of S researchers, fababean, canary seed, winter wheat, flax, meadow brome, and timothy were selected for the study. The Land Resource Centre compiled soil and climate suitability maps for each crop, at a scale of 1:100,000 for the study area.

Informational meetings were held in east-central Saskatchewan, a report written, and a presentation made to the Soils and Crops Workshop in February 1999.

14. Hog-HEMS Environmental Management Strategy

Suitability of land for application of hog manure.

This is a three prairie province wide collaborative effort among AAFC Research Branch, PFRA and provincial agencies to develop a methodology to evaluate the suitability of land for application of hog manure. The suitability of land for application of hog manure is rated in terms of soil management groups based on soil and environmental response to manure nutrients. The methodology makes extensive use of provincial 1:100000 scale soil databases, provincial groundwater databases and regional climatic databases.

15. Parkland Agriculture Research Initiative - PARI-DSS

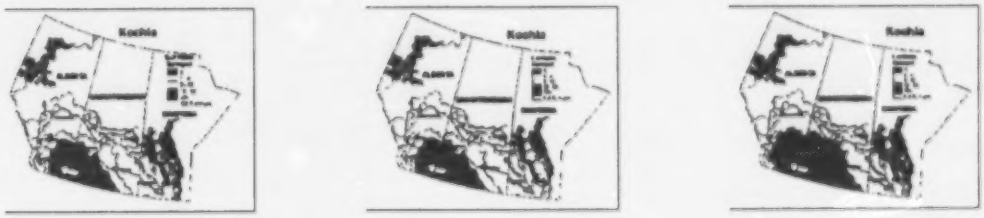
Funding - PARI Initiative (Agriculture and Agri-Food Canada)

Land Resource Centre staff have been involved in supplying technical assistance in software design, software testing and supplying agronomic information for the development of the Farm Smart 2000 software of the PARI DSS. This project is an excellent example of a successful working partnership, facilitated by both partners being located at the University. More information on PARI may be obtained at http://paridss.usask.ca/

16. Weed Frequency Map Development

Funding - Agriculture and Agri-Food Canada
(Collaborative Agreement - Parkland Agricultural Research Initiative)

In conjunction with the Prairie Weed Biology, Ecology and Management group of Agriculture and Agri-Food Canada, headed by Gordon Thomas of the Saskatoon Research Centre, maps were created illustrating weed densities for 35 different species of weeds across the Prairies. The initial project produced maps for weed surveys in the 1980s and in the 1990s correlated to Prairie eco-region and eco-district agro-ecological maps. Maps have now been produced for weed survey information collected in the 1970's creating a time step series of maps covering three decades. Sets of the maps have been provided to public and private interests across the prairies.



Distribution and Density of Kochia from 1970's (left) 1980's (Centre) and 1990's (Right)

17. The Effects of Special Crops on Soil Sustainability in the Brown Soil Zone

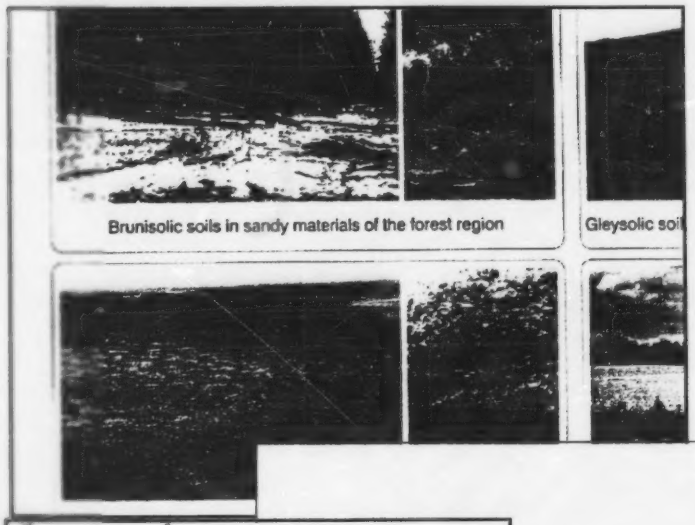
This project was a joint effort of the SLRC and CSALE, the Centre for Studies in Agriculture, Law and the Environment at the University of Saskatchewan.

This project evaluated the sustainability, in terms of risk of erosion, of alternate cropping systems in several Rural Municipalities in South Central Saskatchewan. Risk of erosion was evaluated using the Wind Erosion Equation, the Universal Soil Loss Equation, and the EPIC model for several cropping rotations and tillage methods. Field information was gathered to effectively use the Wind Erosion Equation and the Universal Soil Loss Equation (Water Erosion). Soil erosion risk maps were produced for the various rotations studied.

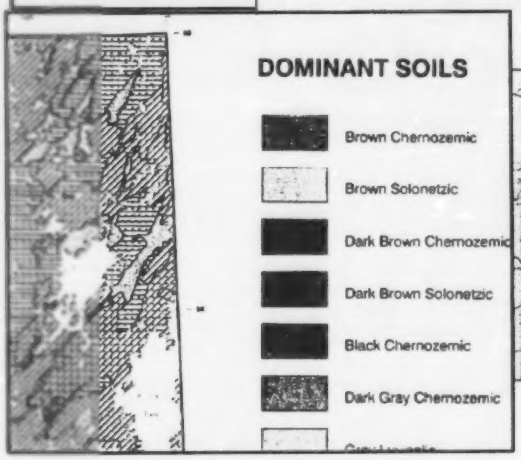
18. Rare Plant and Sage Brush Study

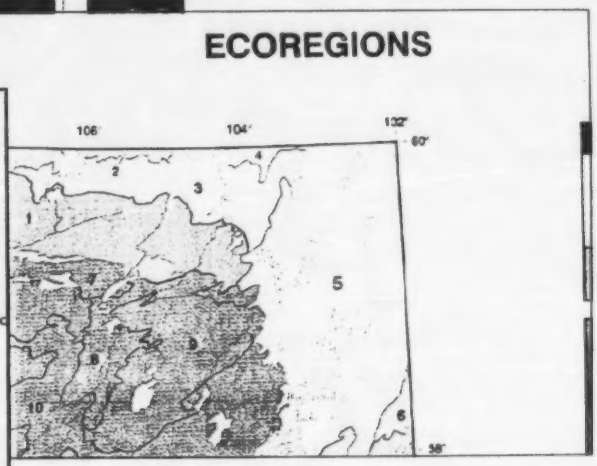
Digital soil line data for 27 soil maps, associated attribute data, and hard copy reports were supplied to Digital Environmental Management Inc. of Saskatoon, for use in a Rare Plant and Sage Brush study throughout an area covered by three NTS mapsheets in southern Saskatchewan. The soil data would be combined with satellite data to facilitate specific analysis.

19. Contributions to the new Atlas of Saskatchewan



The New Atlas of Saskatchewan was produced by the Geography Department of the University of Saskatchewan and released in July of 1999. The Land Resource Centre provided the source, revisions and proofing of maps and text for Soil Capability for Agriculture, Dominant Soils, Wind Erosion and Water Erosion.





20. Rural Municipality Reports compiled for Willow Bunch Lake Map Sheet Area

Reports and maps were re-compiled in a Rural Municipality format for five RMs in the Willow Bunch Lake Map Sheet area. These reports were required by P.F.R.A. as a component of their extension program to help producers make the transition from a wheat-fallow to a more diversified farming system. R.M format reports have a large number of soil interpretations in tabular format, which provide a basis for P.F.R.A. soil conservation personnel to describe the properties, capabilities and limitations of the soil resources for an area, and show farmers how the soil reports can be used as a tool for planning changes in cropping systems and land management.

SM011	Soils of The RM of Hart Butte, Number 11
SM012	Soils of the RM of Poplar Valley, Number 12
SM042	Soils of the RM of Willowbunch, Number 42
SM072	Soils of the RM of Lake of the Rivers, Number 72
SM102	Soils of the RM of Lake Johnson, Number 102

21. Customized Soil Data for Moosomin Band Treaty Land Entitlement

Funding: CESO Aboriginal Services

Data were assembled from several databases, including the Sask Soil Database, Rural Assessment Database and Saskatchewan Crop Insurance to provide a customized information database for 241 quarters of land in north-central and northwest Saskatchewan for the Moosomin Band Treaty Land Entitlement areas. This customized information is being used by the Band and consultants as a planning tool in evaluating their current land holdings and recent purchases.

Soil Capability for Agriculture maps were produced for Moosomin Band Treaty Land Entitlement in Area 1, RM's Round Hill 467, Meota 468, Spiritwood 496, Medstead 497, Parkdale 498 and Area 2, RM's Redberry 435, Douglas 436, Meeting Lake 466. These full color maps were produced to complement the earlier Customized Tabular Soil Data provided to the Moosomin band; both of these products, which provide data for 241 quarters of land in north-central and northwest Saskatchewan, are

being used by the Band and a volunteer soil science professor as a planning tool in evaluating the land holdings for their best use.

22. Soil Survey Ille a la Crosse Area

Funding - CESO Aboriginal Services

Examination of the Soil Resources within the Ille a la Crosse area for the Metis Nation of Saskatchewan. The report and map will show the soil classification of the land in question as well as the agricultural capability of the various land holdings.

23. Electronic Soil Resource Data for the City of Saskatoon

Soil Resource data in electronic format for RM 344 was supplied to the Planning Department, City of Saskatoon. This information is to be used to create interpretive maps that will indicate those areas of most productive soils and subsequently, facilitate land use planning that will avoid development on the most productive soils.

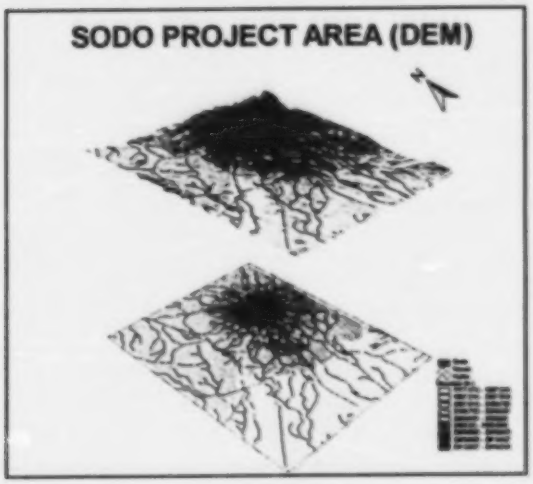
24. Weyerhauser Lease Area-Soil Maps Pilot Study 1999

Funding - Weyerhauser Canada

As part of a pilot project integrating Forest Vegetation maps and soil maps, detailed soil maps and related databases were prepared for Weyerhauser, Canada for nine mapsheets covering approximately 200,000 acres within their forest management lease areas.

25. CIDA - Ethiopian GIS Training

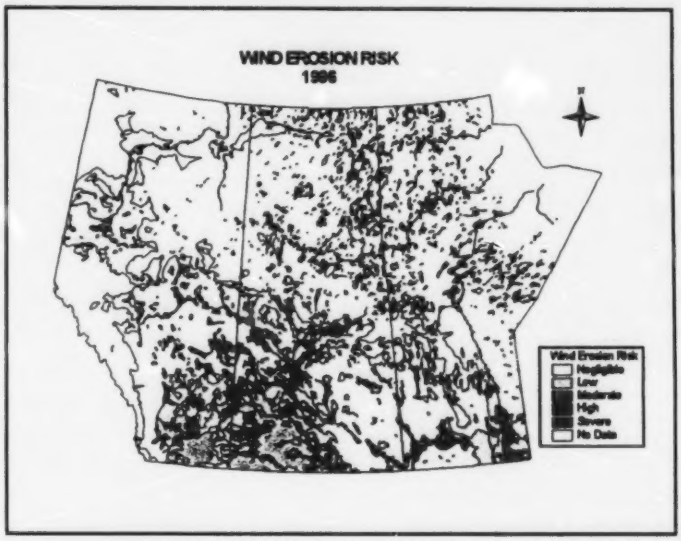
Funding - CIDA



A three month training course was developed and delivered providing GIS and database management training for a technician from Ethiopia. Beginning in early August and completed in October 1999, the course used data from Ethiopia as source information for the development and implementation of the project. The course was tailored to provide the technician with the theory and skills (ARC INFO based) necessary to continue on with the GIS project in Ethiopia. Continued support will be provided in setting up a similar GIS operation in Addis Abba by providing software and data support.

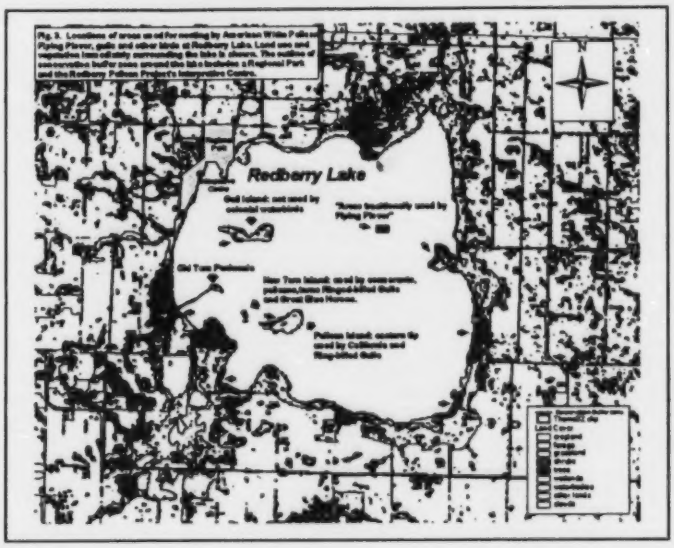
26. SLC and Census Data

The use of 1996 Census of Agriculture data tied to Soil Landscapes of Canada soil polygons (SLC areas) allows for the monitoring and comparison of farming practices as they relate to soil landscapes on the prairies. This enables the study of regional trends in farming practices and how they may impact soil quality in the future. Several Maps have been produced including: Wind Erosion Risk for the Prairies 1996, Forage Crops as a Percentage of total Farmland 1996, Pasture Land As a Percentage of Total Farmland 1996. These maps are produced for a variety of purposes including program evaluation and extension.



27. Important Bird Areas Program-Nature Saskatchewan (Redberry Lake)

This program is a study of important bird habitats throughout Saskatchewan. The Land Resource Centre is contributing GIS support for this project. The initial site for this study was the Redberry Lake area. Maps produced include: The Redberry Lake Drainage Basin, Water Erosion Potential of Soils in the Redberry Lake Watershed,



Land use and Bird Habitats Around Redberry Lake, Elevation and Topographic Profile map of the Redberry Lake Area. This project is a prime example of an evident need for land resource information to enrich the evaluation for bird habitats, that was provided at no cost to the project. The project was joint with CSALE.

28. Land Productivity - Yield Data Review

Confidential Report.
Funding: Saskatchewan Crop Insurance Corporation.
The Land Resource Centre was commissioned by the Sask Crop Insurance Corporaton to conduct a review of crop insurance quarter section yields and land productivity ratings to determine the relationship and predictability of yield based on soil type in any individual year. The review was part of a general review by Crop Insurance on the current method of offering insurance and how the system may be modified to be more responsive to producers concerns and needs. A report was presented to Crop Insurance in February 1999.

29. Drainage Issues in the Blackbird Watershed of the Assiniboine River System

Drainage and flooding concerns in the Assiniboine River basin created by landowners draining lowlands and wetlands continues to be a concern in East Central Saskatchewan and West Central Manitoba. Sask Water and PFRA, working jointly on a study in the Black Bird Creek Watershed, requested information pertaining to a soil and landscape's capability for agricultural production following drainage. A report was prepared which provided background information on assessing agricultural capabilities and the agricultural capabilities of drained wetland areas. A listing of characteristics of soils and landscapes were provided by quarter section for the Blackbird Watershed area.

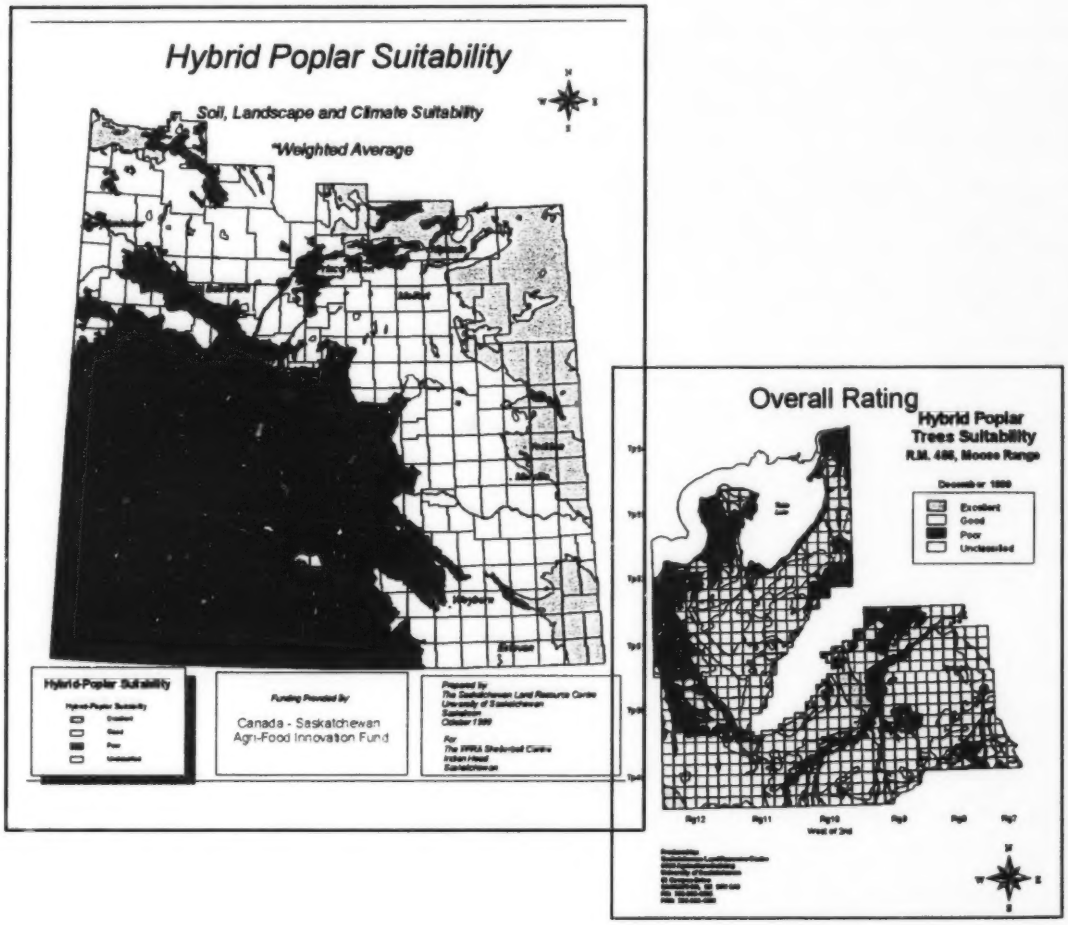
30. GIS Training - Potash and Phosphate Institute of Canada

The Potash and Phosphate Institute of Canada through its International Development program is extensively involved in research related to soil and crop management in many locations throughout the world. Current programs have identified a need for the development of data management and GIS system development in China to assist in regional scale logistic planning in order to support the ordering, supply, distribution and use of potash by farmers across various provinces in China.

Seminars on data handling and site specific nutrient management were delivered at a conference on Site Specific Nutrient Management in Yantai, China and seminars to specific staff at the Chinese Academy of Agriculture Sciences in Beijing.

31. Poplar Tree Suitability

In conjunction with the PFRA Shelterbelt Centre in Indian Head, the centre has entered into a project to create provincial and 1:100,000 scale maps showing areas of the province most suited to hybrid poplar tree plantation development. By applying criteria developed at the Shelter Belt Centre, the Centre has developed provincial suitability maps plus selected 1:100,000 soil maps for the province. Hybrid Poplars, are potentially a key part of carbon sinks and the sequestration of carbon as defined by the Kyoto protocol.



32. Soil and Landscape Suitability for Straw Harvest for Strawboard Manufacturing

At the request of SAF, the Land Resource Centre prepared a series of maps based on the Soil Landscape of Canada Maps and related Census of Agriculture data showing the limitations to straw removal for industrial use. Considerations were based mainly on the need for residue cover to protect erodible soils from wind erosion, particularly in areas such as the Brown soil zone where about 40% of the land is in summerfallow. This project is a good example of a comparatively straight forward analysis, delivered in a tight time frame, at no additional cost to Saskatchewan Agriculture and Food.

33. Irrigation Suitability for the RMs of 191, 193, 222, 223.

Cooperator: PFRA
Interest has been expressed in irrigation development in an area north of Moose Jaw including the RM's of 191, 193, 222 and 223. Soil irrigation suitability maps were created for the four RM's and provided to PFRA in Moose Jaw in paper and digital formats.

34. Treaty Land Entitlement - Lebret

Cooperator: Don Rennie
Funding: CESO Aboriginal Services

Soil, Landscape and land use capability information has been supplied associated with the expansion of Metis lands surrounding current land holdings in the Lebret area.

35. Irregular Field Shape Study

Cooperator: Sask Crop Insurance Corporation:

SCIC was investigating the variation in reported acreage of cultivated land based on the variation in field shape. The Land Resource Centre completed preliminary investigations on the potential use of soil and landscape information as an indicator of where irregular shaped fields may occur and as indicators of field size adjustments. Preliminary results were returned to SCIC for further study.

36. Herbicide Residue Study

Cooperator: Cyanamid Canada

A project to provide soil and landscape details for over 200 quarter section legal locations was completed for Cyanamid Canada in relation to determining the likelihood of herbicide residue carryover. The report also outlined some of the basic soil properties for the area plus a review of soil forming factors. The report (800 pages) was provided in an innovative Windows HELP File CD based format which included the incorporation of maps and hypertext linked information files.

37. Irrigation site mapping system

Cooperator: Sask Water

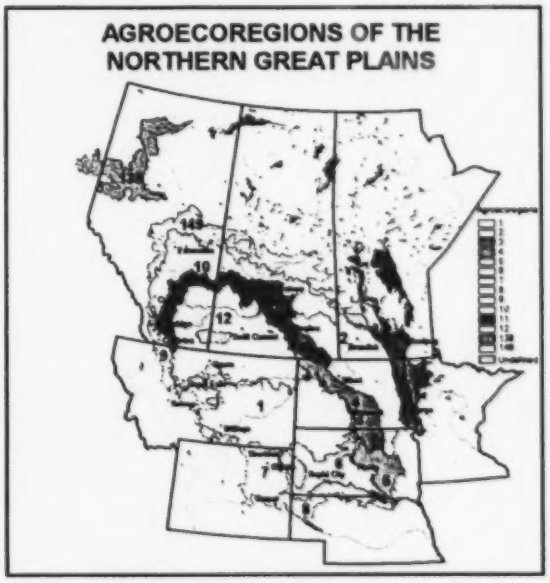
Preliminary work has been initiated to develop a graphical interface utilizing ARCVIEW GIS, for the Sask Water Irrigation information system, which would allow personnel in District offices of Sask Water to query irrigation sites graphically for information on project type, farmer identification and irrigation characteristics Initial development is being coordinated through Garth Weiterman in Outlook.

38. ESRI Canada Software Licensing

Cooperators: The University of Saskatchewan GIS consortium, SIAST and ESRI Canada.

As a member of the U of S GIS consortium, the Land Resource Centre has finalized an agreement with ESRI Canada which increases access to all ESRI GIS software for the U of S and all SIAST campuses in Saskatchewan. The agreement provides for unlimited use of ESRI products for Educational purposes at a price substantially lower than existing retail prices. In exchange, SIAST and the U of S pay a single user fee and assume a greater role in product administration. As a result, all Land Resource Centre staff have access to the latest GIS software at a reasonable cost to the Centre.

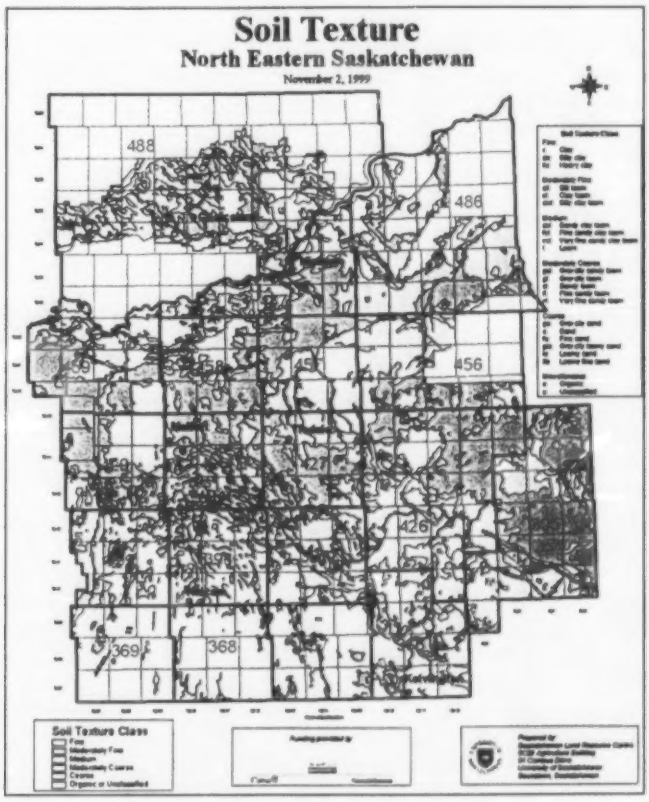
39. Agro-ecological regions of the North American Great Plains



While Agro-ecological regions have been utilized within Canada they had not been standardized or linked to similar regions in the United States. A project to link and standardize ecological regions across the Canada and US border resulted in an updated Agro-ecological map for the Great Plains Region of North America.

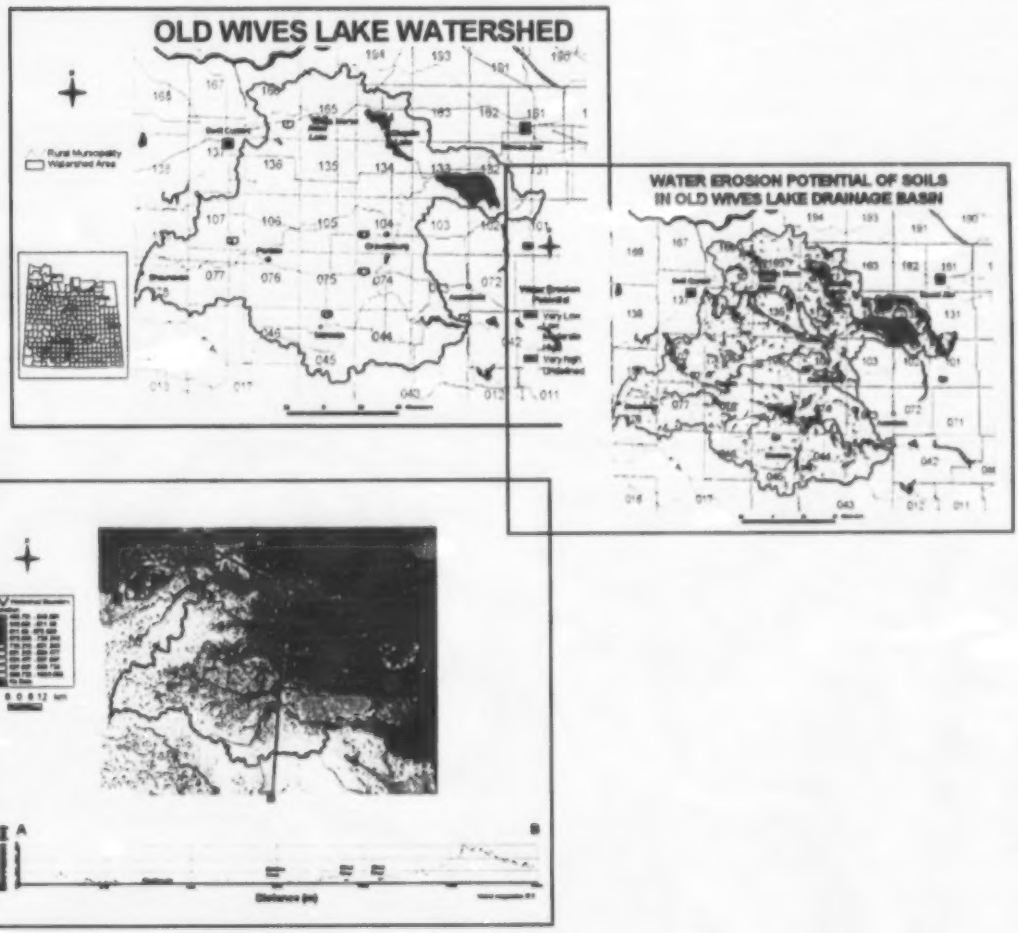
40. Soil Texture Map for North East Saskatchewan

At the request of SAF, the Land Resource Centre prepared a texture map of North East Saskatchewan. The map was prepared in response to the post harvest discussions concerning ergot in wheat and its association to soil textures and micro-nutrient deficiencies including copper.



41. Old Wives Lake Important Bird Area

This Old Wives Lake Important Bird Area program is part of the study of important bird habitats throughout Saskatchewan. The Land Resource Centre is contributing GIS support for this project. Maps include the definition of the Old Wives lake Watershed, elevation maps and cross sections and erosion potential maps within the Watershed boundaries.



42. One Arrow First Nation Information

Soil data and maps were prepared for the One Arrow First Nation with regards to Reserve Lands and Treaty Land Entitlement Lands. Data was assembled from several databases, including the Sask Soil Database, to provide a customized information database for lands under Band management. This customized information is being used by the Band and consultants as a planning tool in evaluating their current land holdings.

43. Soil Mapping in the Weyerhaeuser FMAs

Based on a pilot study conducted earlier for Weyerhaeuser Canada, an 18 month soil mapping project has been launched in coordination with Weyerhaeuser. The project includes the remapping of soils in selected areas of the Weyerhaeuser FMA. Soil information will be compiled in a digital format and integrated with the vegetation inventories being updated and compiled by Weyerhaeuser and their associated Forest Management Companies.

44. Environmentally Sustainable Production Practices for Diversified Cropping Systems in the Semi-arid Prairie.

This collaborative project with Dr. Brian McConkey of the Semi-arid Prairie Agricultural Research Centre (SPARC) looked at residue levels produced by oilseed and pulse crops grown in the Brown and Dark Brown soil zones of Saskatchewan under various farming systems to evaluate the erosion potential associated with the production of these crops. Products emanating from this research will include a fact sheet providing information on management practices that will maintain levels of residue required to minimize the risk of erosion and two spread-sheet erosion calculators that allow calculation of erosion risk associated with crops, residue levels and specific management practices.

This project involved a graduate student from the Department of Soil Science, who researched a related topic for his M.SC thesis. It is an excellent example of the linkage between AAFC researchers and academic programs.

Extension and Publications

Papers, Presentations and Posters

1) SaskGIS 97 - Partnering Towards an Integrated Geographic Information Infrastructure
Paper Presentation - The Saskatchewan Soil Resource Database - Henry de Gooijer

2) SaskGIS 97 - Poster Presentations - Soil and Landscape Suitability for Potato and Dry Bean Production

3) Saskatchewan Wheat Pool Delegates Annual Meeting 1997
Poster Presentation - Site Selection Variables for Manitou Hog Enterprises.

4) Soils and Crops Workshop, Saskatoon February 1998
Poster Presentation - Site Selection Variables for Manitou Hog Enterprises

5) On-Farm Adaptation/Diversification in East-Central Saskatchewan

Presentations were made in December 1998 in Norquay (Hilliard) and in Canora in January 1999 (de Gooijer) presenting the results of the Land Resource Centre components of the project. This project is an evaluation of alternative crops and cropping system, in response to the reduced economic returns from cereal crops related to the high costs of grain transportation. A series of interpretive maps, based on the detailed (1:100,000) soils database and climate information, rating relative suitability/feasibility of crops such as fababean, canary seed, flax, brome and timothy have been created and delivered to PFRA.

6) The Saskatchewan Soil Database and its Applications. 1999
A poster describing the Provincial soils database and its applications was displayed at the Soils and Crops workshop. The poster describes the various soil databases maintained by the Saskatchewan Land Resource Centre , how these databases are linked to other data sets such as The Census of Agriculture, and the

National Ecostratification Framework and examples of their applications for a variety of resource related uses.

7) Integration of Soil and Satellite Wetland Information 1999

A cooperative project with Phil Curry and Richard McBride of Ducks Unlimited was illustrated through a poster showing the integration of soils and wetlands data in order to predict occurrences of salinity and the suitability of the surrounding land for DU project consideration.

8) Weed Density and Population Changes over Three Decades. 1999

In cooperation with Dr. Gordon Thomas of Agriculture and Agri-food Canada, Saskatoon Research Centre, a poster was developed based on the information from three decades of weed survey information from Alberta, Saskatchewan and Manitoba. Using three common weeds as indicators, maps for each weed illustrated the variation in weed populations over time and geographic location utilizing the Eco-regions map of the prairies as a base.

9) Indian Head Precision Farming Research Report (Summary of Objectives and preliminary survey data). 1999 Glenn Padbury co-author.

10) Mapping soil and Climate Suitability for Specific Crops. 1999 Clint Hilliard and Darrel Cerkowniak. Reporting on work conducted in the east central crop diversification research study.

11) Wind Erosion Risk as an Indicator of Soil Quality 1999 Glenn Padbury

12) GIS in Agriculture Workshop 1999

Three presentations were made to GIS in Agriculture Workshop, Saskatoon, on the Evolution and Status of the Saskatchewan Soil Resource Database as well as on Applications of the Soil Resource Database in a GIS environment as a decision support tool in a variety of land use and management issues and on the Soil Landscapes of Canada maps and databases.

13) Land Reclamation Conference 1999

Presentation was made to the Canada Land Reclamation Association on the status and content of the electronic Saskatchewan Soil Resource Database.

Special University Presentations

14) D.W. Anderson, 1999. Soils and Us. Special Seminar at the College of Agriculture on the importance of soils in providing ecosystem services to support our economy and society.

15) Students in two Soil Science courses, SLSC 332.3 (Soil Genesis and Classification) and SLSC 470.3 (Evaluation of Land Resources), as well as those in course SLSC 412.3 are presented with a substantial amount of material on soil survey and related databases, applications, GIS and related land resource evaluation exercises. D. Cerkowniak has been particularly valuable in preparing and printing graphics for use in presentations and serving as a resource for student projects.

16) D.W. Anderson, 1999. Update on the Prairie Ecosystem Study (PECOS) . Beechy April 1999.

17) D.W. Anderson 1999. Ecology, Soils and Land Use of Southern Saskatchewan Canada. Presented to Awassa College of Agriculture, May 1999, Awassa Ethiopia.

18) D.W. Anderson 1999. Soils and Ecosystems Services. Invited Seminar, University of Alberta, April, Edmonton.

19) Presentation was made to Engineering students at the U. of S. on the Soil Survey and it's evolution, the Saskatchewan Land Resource Centre, and the Saskatchewan Land Resource Database and it's applications.
Presentations were also made to Vocational Agriculture students in the Special Topics Class, Agronomy 35.

20) D.W. Anderson, D.J. Pennock, R.F. Anderson and A. Frick. 1999. Monitoring Soil Carbon Mass in Black Chernozem Soils. Presented to the Annual Meeting of the CSSS, Charlottetown, PEI.

21) T.A. McInnis, W.D. Eilers, B.G. McConkey, and D.W. Anderson, 1999. Soil Management and Residue Conservation to Reduce the Deleterious Effects of Soil Crusting. Presented to the Annual Meeting of the CSSS, Charlottetown, PEI.

22) H. de Gooijer, Presentation on the Saskatchewan Land Resource Database to the IT Works Conference in Saskatoon, Nov 30, Dec1-2, 1999.

23) H. de Gooijer, Presentation to SAF, SSCA, PFRA staff on the Land Resource Database in Swift Current Dec 15, 2000.

24) H. de Gooijer, D. Cerkowniak, Presentation to SAF GIS staff in Regina on the Sask Land Resource Database and possible applications within SAF and joint projects between SAF and the Land Resource Centre (October 18, 1999)

25) H. de Gooijer, Presentations on the Land Resource Database and data handling techniques to the Chinese Academy of Agricultural Sciences (Beijing) and to a Conference on Site Specific Nutrient Management and Potassium Fertilizers (Yantai) on August 23-25, 1999

26) H. de Gooijer, Presentation to High School Biology Class (December) on basic soil information, landscapes and ecosystems in Saskatchewan (Education Program) Kelliher High School (25) December 1999.

27) G. A. Padbury. Soils of Saskatchewan.. Forest Soils Workshop, Forest Ecosystem Branch, SERM, Prince Albert. 1999.

28) G. A. Padbury. Saskatchewan Land Resource Centre. National Soil Survey Centre, Lincoln Nebraska. 1999.

29) G.A. Padbury. Agroecoregion and Land Resources of Northern Great Plains . American Society of Agronomy Annual Meeting. 1999. Salt Lake City Utah.

30) G. A. Padbury. Soil Carbon Enhancement. 1999. SSCA Agronomy Workshop, Sands Hotel, Saskatoon, Sask.

31) D.W. Anderson, 1999. Soils and Landscapes of the Saskatoon Area. A one day course for ASSIST, the summer institute for high school science teachers.

32) H. de Gooijer, 2000. Land Evaluation for Intensive Livestock Operations. Presented to Soil Science 470 Class, Dept of Soil Science. March 2000.

Tours and Field Trips

1) Northern Forest Soils Tour (Summer 1998)

A soil tour of Northern soils was prepared and conducted by Glenn Padbury highlighting the major soils of Northwest Saskatchewan. The three-day tour provided insight into soil-plant relationships and soil classification along the forest fringe. The tour was attended by 15 representatives of the University of Saskatchewan Soils Department, Land Resource Centre, Mistik Management, Weyerhaeuser and SERM. Additional tours are now being considered for other areas of the province.

2)PFRA/SSCA Soil Seminars and Tour

AUG 17 - 19, 1998: a seminar and field tour was organized and conducted by Glen Padbury and Alvin Anderson for Soil Conservation personnel from P.F.R.A. in Saskatchewan. On August 17 a seminar was held at the Agriculture Building, University of Saskatchewan; it was designed to give a background on bedrock geology, glacial history and surface deposits, soil formation processes, map symbology and soil resource databases. On Aug. 18 a field tour was provided in the area from Saskatoon to Prince Albert, and on August 19, a field tour was provided in the local Saskatoon area to examine and explain soil-landscape relationships, and the nature and properties of the soils encountered. The seminar and field tour introduced conservation personnel to the type of soil information that is available, facilitated correlation between map data and field examinations, effective utilization of the soil resource data for a variety of uses, and identification of soil types for research projects.

2) Southwestern Saskatchewan Soil Tour

A three day soil tour of Southwestern Saskatchewan was carried out in late July. Departing from Swift Current each morning, the tour consisted of day long trips through the Prelate, Cypress Hills and Wood Mountain NTS sheet areas. The first day of the tour was based in the Prelate sheet area and focused on textural variation, parent

material differentiation and soil formation on the various landscapes of the area. Stops were made at some of the areas interesting natural landforms including the Great Sand Hills and the Lancer Ice Thrust Ridges. The second day of the tour was based in the Cypress sheet and focused on variations in soils on the Cypress Bench, soil salinity near Shaunavon and the Frenchman River Valley. The third day of the tour was spent exploring soils in the Wood Mountain sheet with stops in the Grasslands National Park and surrounding area. Attendance during the three days of the tour varied from 20 to 35 persons and included representation from the Conservation Learning Centre (SERM), Lands Branch, Sask Ag and Food, PFRA, Sask Water, SPARC, Forestry Branch (SERM) and private individuals from the area.

Publications

The following Rural Municipalities in the province have had soil reports prepared. These reports describe the soils and landscapes of the RM as well as provide soil attribute tables to accompany the soils maps.

The Soils of Arborfield Rural Municipality #456	Publication	SM456
The Soils of Duck Lake Rural Municipality #463		SM463
The Soils of Leask Rural Municipality #464		SM464
The Soils of Meeting Lake Rural Municipality #466		SM466
The Soils of Round Hill Rural Municipality # 467		SM467
The Soils of Moose Range Rural Municipality # 486		SM486
The Soils of Nipawin Rural Municipality #487		SM487
The Soils of Torch River Rural Municipality #488		SM488
The Soils of Garden River Rural Municipality #490		SM490
The Soils of Buckland Rural Municipality # 491		SM491
The Soils of Shellbrook Rural Municipality #493		SM493
The Soils of Canwood Rural Municipality #494		SM494
The Soils of Spiritwood Rural Municipality # 496		SM496
The Soils of Medstead Rural Municipality # 497		SM497
The Soils of Parkdale Rural Municipality #498		SM498
The Soils of Mervin Rural Municipality #499		SM499

Saskatchewan Land Resource Centre
University of Saskatchewan

Canada AgriFood Saskatchewan

The Soils of Frenchman Butte Rural Municipality #501	SM501
The Soils of Britannia Rural Municipality # 502	SM502
The Soils of Paddockwood and Lakeland Rural Municipalities # 520&521	SM520/521
The Soils of Big River Rural Municipality #555	SM555
Soils of The RM of Hart Butte, Number 11	SM011
Soils of the RM of Poplar Valley, Number 12	SM012
Soils of the RM of Willowbunch, Number 42	SM042
Soils of the RM of Lake of the Rivers, Number 72	SM072
Soils of the RM of Lake Johnson, Number 102	SM102

1) Soil Resource Index of Saskatchewan. 1998, 1999, 2000 . - An updated listing of all soil resource information available from the Land Resource Centre.

2) Acton, Donald F., Glenn A. Padbury, and Colette T. Stushnoff. 1998. *The Ecoregions of Saskatchewan.* Plains Research Centre, Univ. of Regina, Regina, Sask. 205p.

Publication: M137 Irrigation Suitability and Land use for the Qu'Appelle Valley (Buffalo Pound/ Lake Diefenbaker Area)